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Indian Standard
SPECIFICATION FOR MAXIMUM DEMAND INDICATORS, CLASS 1

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NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR MAXIMUM DEMAND INDICATORS, CLASS 1

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(*Continued on page* 2)

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SPECIFICATION FOR MAXIMUM DEMAND INDICATORS, CLASS 1

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 11 August 1977, after the draft finalized by the Integrating Meters Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Maximum demand indicators are employed to indicate the maximum demand in industrial metering. The object of this standard is to unify the requirements of maximum demand indicators and to cover them in a single standard which were earlier covered in several parts of IS : 722*. This standard has been made available separately and will be referenced to in the relevant parts of IS : 722*, wherever indication of maximum demand is required.

0.3 Maximum demand indicators covered in this standard are of accuracy class 1. Maximum demand indicators of this class may be attached to watthour meters, varhour meters, or voltamperehour meters of any accuracy class.

0.4 In the preparation of this standard, considerable assistance has been derived from IEC Pub 211 (1966) ' Maximum demand indicators, class 1·0 ' issued by the International Electrotechnical Commission.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies requirements and tests for maximum demand indicators of an accuracy class 1 intended to operate as attachment to watthour meters, varhour meters or voltamperehour meters, coupled mechanically thereto and to indicate the maximum of average power (active, reactive or apparent) measured during successive equal intervals of time. It applies to meters only as regards mutual effects between the maximum demand indicators and the meters.

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*Specification for ac electricity meters.

†Rules for rounding off numerical values (*revised*).

1.1.1 This standard does not apply to maximum demand indicators based on thermal effects, or those operated by impulses; nor to cumulative indicators intended only for control purposes.

1.2 The requirements of supporting meters are covered in the individual parts of IS : 722*.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Indicated Maximum Demand — The highest value of the mean power (active, reactive or apparent) indicated by the maximum demand indicator during successive equal intervals of time, between one zero resetting of the maximum demand indicator and the next.

NOTE — The maximum demand may be indicated by a pointer movable over a fixed scale, or by a fixed index near to a movable graduated drum(s).

2.2 Mean Value of Power (Active, Reactive or Apparent) — Active, reactive or apparent energy divided by the time in which this energy was produced or absorbed.

2.3 Demand Integration Period — The nominal duration of the consecutive equal intervals of time (for example, 30 minutes), which comprises the time the driving element of the maximum demand indicator is coupled to the meter, and the detent time.

2.4 Maximum Demand Indicator — An attachment to an integrating meter to indicate maximum demand (*see* **2.1**) which generally comprises the following:

a) Driving element;
b) Disconnecting (tripping or detent) element;
c) Restoring element;
d) Timing element;
e) Maximum demand pointer and dial, or graduated drum(s) and fixed index; and
f) Maximum demand zero resetting device.

NOTE — These components are subsequently defined.

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*Specification for ac electricity meters.

2.5 Cumulative Demand Indicator — A maximum demand indicator as defined in **2.4** with supplementary graduated drums in order to sum the maximum demand indications of successive zero resetting operations.

2.6 Cumulative Demand Indicator for Control Purposes — A cumulative demand indicator as defined in **2.5** but usually of lesser accuracy and used for control purposes only.

2.7 Supporting Meter — Integrating meter to which the maximum demand indicator is attached and which operates the driving element of the maximum demand indicator.

2.8 Driving Element — Element which when operated by the supporting meter can drive the maximum demand pointer or drum(s).

2.9 Disconnecting (Tripping or Detent) Element — Element which releases the coupling between the maximum demand indicator and the supporting meter.

2.10 Restoring Element — Element which restores the driving element to its initial position without affecting the position of the pointer or the drum(s).

2.11 Timing Element — Element which determines the demand integration period.

Note — The timing element may be internal or external to the meter case.

2.12 Maximum Demand Pointer or Drum(s) — Pointer which can move against slight friction over a fixed scale, or graduated drum(s) which can move against slight friction near to a fixed index.

2.13 Maximum Demand Zero Resetting Device — Device which enables the maximum demand pointer or drum(s) to be reset to the scale zero, manually or by other means.

2.14 Detent Time — The interval of time at the end, but within each demand integration period during which the disconnecting element releases the coupling between the maximum demand indicator and the supporting meter, to allow the driving element to be restored to its initial position.

2.15 Scale Marks — Series of lines which enable the position of the pointer or drum(s) to be identified.

2.16 Scale Division — The interval between two consecutive scale marks.

2.17 Scale Numbering — The series of numbers forming part of the scale.

2.18 Scale — The series of marks and numbers from which is obtained the value of the measured quantity.

2.19 Dial — Plate whose visible surface carries one or more scales and also the necessary symbols and inscriptions.

2.20 Effective Range — That part of the scale where measurements can be made with the stated accuracy.

2.21 Rating (in Terms of the Quantity Measured) — The value of the quantity which corresponds to the upper limit of the effective range.

2.22 Constant *K* of a Maximum Demand Indicator — Coefficient by which the reading in arbitrary divisions shall be multiplied to obtain the value of the corresponding power (active, reactive or apparent).

2.23 Reading Factor *C* of a Maximum Demand Indicator — Factor by which it is necessary to multiply the reading in units of power (active, reactive or apparent), in order to obtain the value of the corresponding power expressed in the same units.

2.24 Type Tests — Tests carried out to prove conformity with the requirements of specification. These are intended to prove the general qualities and design of a given type of maximum demand indicator.

2.25 Routine Tests — Tests carried out on each maximum demand indicator to check requirements which are likely to vary during production.

2.26 Acceptance Tests — Tests carried out on samples selected from a lot for the purpose of acceptance of the lot.

3. CLASSIFICATION

3.1 Maximum demand indicators may be classified according to their percentage error limit at the rating, independently of the error of the supporting meter.

3.2 The limit of the percentage error of maximum demand indicators covered in this standard is ±1 percent. These maximum demand indicators are of class 1.

4. GENERAL AND CONSTRUCTIONAL REQUIREMENTS

4.1 General — All insulating materials used in the construction of maximum demand indicators shall be non-hygroscopic.

All parts, which are subject to corrosion under normal working conditions, shall be effectively protected against corrosion due to atmospheric causes. Any protective coating shall not be liable to damage by ordinary handling, nor injuriously affected by exposure to atmosphere under ordinary conditions of service.

4.2 Case — The maximum demand indicator shall have a dustproof case common with the supporting meter, which can be sealed in such a way that the interior of the meter is only accessible after breaking the appropriate seal(s).

Degree of protection of the maximum demand indicator shall be similar to that of the supporting meter. Metal parts of the maximum demand indicator accessible from outside, if insulated from the meter, shall be provided with means for the effective connection of an adequate earthing conductor.

The knob of the zero resetting device shall be properly insulated irrespective of the material from which it is made.

4.3 Window(s) — If the meter case is not transparent, one or more windows shall be provided for reading the integrating meter register and the maximum demand indicator dial or drum(s), and for the observation of the rotor. These windows shall consist of plates of transparent material which cannot be removed without breaking the seal(s).

4.4 Maximum Demand Zero Resetting Device — This device shall be such that, in its normal position, it does not affect the maximum demand indicator pointer or drum(s), and such that it can be sealed or locked in this position. Resetting of the maximum demand indicator pointer or drum(s) shall only be possible either after breaking the seal or with a special tool.

4.5 Scale, Pointer, Drum(s), Effective Range and Scale Marks — The maximum demand shall be indicated by means of a pointer moving over a scale, or by a drum(s) moving near to a fixed index. The scale shall be numbered in W, kW, MW, var, kvar, Mvar, VA, kVA, or MVA or arbitrarily.

If it is numbered arbitrarily, the value of the maximum demand in appropriate units shall be derived by the use of constant K which shall be marked on the dial [*see* **6.1** (b)(1)].

If the scale is graduated and numbered in units of the quantity to be measured, these units shall be marked on the dial. In the latter case it may be necessary to multiply the reading by the factor C, having regard to transformation ratios, in order to obtain the indicated maximum demand in the same units [*see* **6.1** (b)(2)].

Unless otherwise specified by the purchaser, the upper limit of the effective range shall correspond to at least 120 percent of the rating.

The lower limit of the effective range shall be 20 percent of the rating.

The tip of the pointer or index shall extend over approximately half the length of the shortest scale marks.

All the scale marks shall be of the same thickness, which shall not noticeably be different from the thickness of the pointer or index tip.

Every fifth scale mark shall be longer than the others and every tenth scale mark shall be still longer. Only the longest marks shall be numbered, each division shall correspond to 1, 2 or 5 times the units of the measured quantity or the unit multiplied or divided by 10^n, 'n' being a positive whole number.

Equivalent conditions are valid for drum type maximum demand indicators and the rating shall be marked on the dial.

If the maximum demand indicator has both pointer and drum indicators, the accuracy requirements need apply to only one.

The accuracy of the maximum demand indicator shall be achieved without the use of a special optical aid for reading.

4.6 Terminals — If required by the parties, at least one additional terminal shall be provided for auxiliary circuits.

4.7 Stability of Maximum Demand Indication — Except when being reset to zero or driven by the maximum demand mechanism, the maximum demand indicator pointer or drum(s) shall not move under normal conditions of use.

4.8 Detent Time — The detent time shall not exceed 1 percent of the demand integration period or 15 seconds, whichever be the greater.

This time is included in the demand integration period.

4.9 Standards Values of Demand Integration Periods — The standard value of the demand integration period shall be 30 minutes. Other values, such as 10, 15 and 60 minutes are also admissible.

5. CONNECTION DIAGRAMS AND TERMINAL MARKINGS

5.1 In addition to the connection diagrams specified for the supporting meters [*see* IS : 2032 (Part XVIII)-1976*], every maximum demand indicator shall be accompanied by a connection diagram showing the correct connection of the meter and maximum demand indicator.

If the meter terminals are marked, this marking shall appear on the diagram.

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*Graphical symbols used in electrotechnology: Part XVIII Symbols and connection diagrams for integrating meters.

6. MARKINGS OF MAXIMUM DEMAND INDICATORS

6.1 The maximum demand indicator dial shall bear the following information:

a) Manufacturer's name, or trade-mark;

b) The constant K or the reading factor C, as applicable;

For Example:

1) $K = 20$ kW/div, and

2) Maximum demand in kW = Scale reading × C: for a 5 A, 100 V demand indicator used on a 100 A, 10 000 V circuit with 100/5 A current transformer and 10 000/100 V voltage transformer, C would be $20 \times 100 = 2\,000$.

c) The demand integration period in minutes, for example, 30 minutes;

d) Reference voltage and reference frequency of auxiliary circuits if different from the voltage and frequency of the supporting meter;

e) The detent time in seconds for an external timing device or alternatively this time may be marked on the nameplate of the supporting meter;

f) The unit in which the maximum demand indicator registers, if required (*see* **4.5**); and

g) The rating of drum type maximum demand indicators.

6.1.1 Any of the information relating to the supporting meter may also be marked on the maximum demand indicator dial.

6.1.2 The maximum demand indicator may also be marked with the Standard Mark.

6.1.3 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7. TESTS

7.0 General — All tests shall be carried out on the maximum demand indicator with the supporting meter.

7.1 Classification of Tests

7.1.1 *Type Tests* — Test schedule and the sequence of type tests shall be as given below:

a) Insulation resistance [**9.2** of IS : 722 (Part I)-1977*],
b) Starting (**7.2**),
c) Limits of errors (**7.3**),
d) Power loss (**7.4**),
e) Temperature-rise (**7.5**),
f) Dielectric strength (**7.6**),
g) Mechanical burden (**7.7**), and
h) Disconnecting element and timing-motor operating voltage limits (**7.8**).

7.1.1.1 *Number of samples and criteria for conformity* — Type tests shall be applied to three test specimens; in the event of one specimen failing to comply in any respect, further three specimens shall be taken all of which shall comply with the requirements of this standard.

7.1.2 *Acceptance Tests* — Test schedule and the sequence of acceptance tests shall be as given below:

a) Insulation resistance [**9.2** of IS : 722 (Part I)-1977*],
b) Starting (**7.2**),
c) Limits of errors (**7.3**), and
d) Disconnecting element and timing-motor operating voltage limits (**7.8**).

7.1.2.1 *Recommended sampling procedure and criteria for acceptance* — A recommendatory sampling plan and criteria for acceptance of lot are given in Appendix A.

7.1.3 *Routine Tests* — Test schedule and the sequence of routine tests shall be as given below:

a) Insulation resistance [**9.2** of IS : 722 (Part I)-1977*],
b) Dielectric strength (**7.6**),
c) Starting (**7.2**),
d) Limits of errors (**7.3**), and
e) Disconnecting element and timing-motor operating voltage limits (**7.8**).

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*Specification for ac electricity meters: Part I General requirements and tests (*second revision*).

7.2 Starting — When the supporting meter is coupled to the maximum demand indicator with its driving element at the maximum, but without the indicating pointer or drum(s) being driven, it shall start and continue to run in accordance with the requirements for the supporting meter but with an increased tolerance of 0·5 percent basic current (balanced load in case of polyphase meters).

With the indicating pointer or drum(s) driven, the starting current may reach 4 percent of the basic current.

In the case of drum type registers, the test shall be made with not more than two drums moving.

7.3 Limits of Errors — The limits of errors of the supporting meter and the conditions for tests shall be the same as specified in the relevant part of IS : 722*, except that the tests shall be made so as to take account of the effect of the maximum demand indicator which shall be coupled to the supporting meter, but which shall not be driving its indicator pointer or drum(s). In these conditions, the errors shall be within the required limits for the meter without the maximum demand indicator.

7.3.1 The error of the maximum demand indicator itself over the effective range (which is additional to any error of the supporting meter) shall be within ±1 percent of the rating. Two tests shall be made as follows:

a) One in the region of 25 percent of the rating, and

b) One in the region of 80 percent of the rating.

7.4 Power Loss

7.4.1 *Timing Element*

a) Up to and including 250 V reference voltage and at reference frequency	3 W
b) Above 250 V	An increase of 0·02 W per volt

7.4.2 *Each Auxiliary Circuit*

a) Up to and including 250 V reference voltage and at reference frequency	6 W
b) Above 250 V	An increase of 0·04 W per volt

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*Specification for ac electricity meters.

7.5 Temperature-Rise — With the maximum demand indicator normally operable, the temperature-rise of the supporting meter shall still comply with IS : 722 (Part I)-1977*.

7.5.1 The permissible temperature-rise limit for both the winding of the disconnecting element and for the timing element, if internal, shall be 60°C and this temperature shall be measured by thermocouple.

7.6 Dielectric Strength — The maximum demand indicator shall satisfy the tests specified for the supporting meter.

7.7 Mechanical Burden — When the maximum demand indicator is coupled with its supporting meter, but the maximum demand pointer or drum(s) is not being driven, the disconnection of the driving element shall not cause a greater variation than 3·5 percent in rotor speed at balanced load, 5 percent basic current, reference voltage, reference frequency and unity (zero) power factor for active (reactive) load.

7.7.1 The mechanical burden of driving the maximum demand pointer or drum(s) shall not cause a greater variation than 2·5 percent in rotor speed at balanced load, 20 percent basic current, reference voltage, reference frequency and unity (zero) power factor for active (reactive) load.

7.7.2 The permitted variations in error of the supporting meter due to change in influence quantities shall be the same as those laid down in the relevant part of IS : 722†.

The tests shall be carried out with the disconnecting element of the maximum demand indicators operated, except for the effect of the oblique suspension, which latter test shall be carried out with the indicator coupled but without the indicating pointer or drum(s) being driven.

7.8 Disconnecting Element and Timing-Motor Operating Voltage Limits — The disconnecting element and, if internal, the timing element shall reliably operate within the range of 0·8 to 1·15 times the reference voltage at reference frequency.

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*Specification for ac electricity meters: Part I General requirements and tests (*second revision*).

†Specification for ac electricity meters.

APPENDIX A

(*Clause* 7.1.2.1)

RECOMMENDED SAMPLING PLAN

A-1. LOT

A-1.1 In any consignment all the maximum demand indicators of the same make and manufactured under similar conditions of production shall be grouped together to constitute a lot.

A-1.2 Samples shall be taken from each lot and tested for acceptance tests.

A-2. SCALE OF SAMPLING

A-2.1 The number of maximum demand indicators to be selected shall be in accordance with col 2 of Table 1.

TABLE 1 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

Lot Size (1)	Sample Size (2)	Permissible Number of Defectives (3)
Up to 50	13	0
51 to 100	20	0
101 to 300	50	1
301 and above	80	2

Note — When the lot size is 13 or below, the entire material shall be tested and no defective shall be permissible.

A-2.1.1 The indicators shall be selected at random from each lot. For this purpose, provisions for random sampling given in IS : 4905-1968* shall be adopted.

A-3. NUMBER OF TESTS AND CRITERIA FOR ACCEPTANCE

A-3.1 The indicators selected in accordance with col 2 of Table 1 shall be tested for acceptance tests. If an indicator fails in any one of the acceptance tests, it shall be called a defective. If the number of defectives is found to be equal to or less than the corresponding permissible number of defectives given in col 3, the lot shall be considered as conforming to the acceptance tests; otherwise it shall be rejected.

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*Methods for random sampling.

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